Libby Asbestos Project
Dust Composite Sampling Pilot Study

May 16, 2007
Revision 0

This pilot study is approved for implementation.

Paul Peronard
Team Leader, Libby Site

5/16/07
Date

Libby Asbestos Project
Dust Composite Sampling Pilot Study

May 16, 2007
Revision 0

1.0 Introduction

It is generally believed that Libby amphibole asbestos (LA) contamination in indoor dust is likely to be an important contributor to LA contamination in indoor air. However, it is expected that the level of LA in indoor dust (expressed as LA s/cm^2) may not be constant throughout the house, but that there may be differences between sub-locations. If so, then collecting a "representative" sample of dust may be difficult.

Under current procedures (EPA 2003), two dust samples are collected from each floor of a home, each a composite consisting of three 100-cm^2 templates. Typically, the mean of the two samples is used to characterize the dust level on that floor. Thus, the estimate of dust loading for each floor is based on a set of six templates. If dust loading is highly variable, six templates may not be adequate to accurately reflect the floor-wide average dust concentration, and more templates may be needed to ensure the dust sample is representative. In addition, the optimal time spent vacuuming dust from an area into a cassette is uncertain.

Based on these concerns, the purpose of this pilot study is three-fold:

1) Investigate whether or not there is substantial variability in LA levels in dust loading (structures per cm^2) as a function of the "accessibility" of an area, and/or the nature of the surface (porous vs hard). This is based on the hypothesis that dust in poorly accessible areas or porous materials (carpets, upholstery) may tend to build up and retain higher loading levels of LA than dust in readily accessed (and frequently cleaned) areas, especially those areas that are hard surfaces (e.g., linoleum, hardwood floors, etc.). If so, then dust from less accessible areas and/or porous surfaces might be a more important contributor to LA in indoor air than dust in readily accessible areas and/or hard surfaces.

2) Determine if collecting a dust sample based on a large number of templates (30) will yield a sample that is more nearly representative of a floor than a set of 6 templates. If so, the degree of difference in the two approaches (30 point vs 6 point) will be assessed to determine whether the difference in representativeness is large enough to warrant the added time and effort associated with collection of a 30-point sample. This will be done in two ways:

a) Investigate the degree of correlation between the results of the paired (same floor) 30-point composites and the mean of two 3-point composites. If the two methods yield results that are generally similar, it will be assumed that the 30-point composites provide little additional

information compared to the two 3-point approach. If there is a clear and consistent difference between the two approaches, it will be assumed that the 30 point composite provides better representation of the average concentration across the floor.

b) Investigate the relative precision of the two approaches. That is, at a number of properties, two 30-point composites and two sets of two 3-point composites will be collected. The degree of variability between the two 30-point composites and between the means of the two sets of two 3-point composites will be characterized using appropriate statistical methods. If there is little difference in the precision of the two approaches, it will be concluded that there is little additional merit in a 30-point approach compared to the current approach. If there is a meaningful difference, the approach with the lower between-duplicate variability will be considered to be preferable.

3) The current method for collection of dust samples (ASTM D5755) specifies that each dust sampling template be collected over a time period of two minutes (120 seconds). However, no data have been collected at the site to assess whether this time is optimal or not. Therefore, it is important to investigate the potential importance of sample collection time (seconds spent vacuuming each template) as a source of variation in sample results. This will be done by collecting paired 30-point composite samples using 30-second and 120-second vacuuming times per template, and comparing the results of paired samples. If the results are similar, it will be concluded that a 30-second vacuuming time is adequate. If the samples collected using a 120-second vacuuming time tend to be higher, it will be concluded that the two approaches are not equivalent, and that longer vacuuming time yields more complete extraction of LA from the vacuumed surfaces.

2.0 Selection of Sample Locations

Sample points will be collected from areas classified on a scale of accessibility, and secondarily on a scale of surface porosity. This approach was designed by the Environmental Protection Agency (EPA) and used during assessments of residential properties after the World Trade Center (WTC) attacks:

1. **Accessible** areas refer to locations in the home that are readily accessible to residents on a routine basis. These areas are the most likely to be the locations of routine exposure, and are also the most likely to undergo routine cleaning. For the purposes of this pilot study, accessible areas are stratified into two sub-categories: porous surfaces (e.g., carpet, upholstered furniture, drapes, etc.), and non-porous surfaces (linoleum floors, hardwood floors, counter tops, etc.).

2. **Infrequently accessed** areas refer to locations that residents access only intermittently. These are areas where dust cleaning will be less frequent and

where dust (and LA) may accumulate. This includes areas on tops of shelves, entertainment centers, and refrigerators, etc.

3. **Inaccessible** areas refer to locations that residents access only on a very infrequent basis, such as behind refrigerators or other large infrequently moved objects. These areas are likely to be cleaned very rarely, and hence may be locations where LA may have built up over an extended period of time.

To the extent possible, the sub-sample locations will be collected from each type of accessibility area as indicated below:

1. **Porous Accessible** target areas, if present, and in order of priority:
    a. Carpeted flooring at the main entrance used by occupants
    b. Carpeted flooring at the secondary or less heavily used entrance to the home
    c. Carpeted flooring in the center of the living room or family room
    d. Carpeted flooring in the center of bedrooms
    e. Carpeted flooring in an acknowledged or evident route of high traffic (i.e., hallway or other thoroughfare)
    f. Carpeted flooring in the kitchen
    g. Upholstered furniture in any frequently used room
    h. Drapes or curtains in any frequently used room

2. **Non-Porous Accessible** target areas, if present, and in order of priority:
    a. Un-carpeted flooring at the main entrance used by occupants
    b. Un-carpeted flooring at the secondary or less heavily used entrance to the home
    c. Un-carpeted flooring in the center of the living room or family room
    d. Un-carpeted flooring in the center of bedrooms
    e. Un-carpeted flooring in an acknowledged or evident route of high traffic (i.e., hallway or other thoroughfare)
    f. Un-carpeted flooring in the kitchen
    g. Kitchen counter tops
    h. Table tops in the following rooms: dining room, living room, or family room
    i. Table tops (e.g., night stands, bureaus) in bedrooms
    j. Window sills in the dining room, living room, or family room
    k. Window sills in the bedrooms

3. **Infrequent** target areas, if present, and in order of priority:
    a. Top of the refrigerator, when top is exposed
    b. Top of bookshelves
    c. Shelves of bookshelves
    d. Top of the hot water heater
    e. Beneath the sofa or other large pieces of furniture in the living room
    f. Beneath the bed or other large pieces of furniture in bedrooms

g. Inside kitchen cabinets most frequently accessed

4. **Inaccessible** target areas, if present, and in order of priority:
    a. Beneath infrequently moved heavy appliances (e.g., refrigerator, washing machine, etc.)
    b. Inside forced air floor or ceiling vents in the living room
    c. Inside forced air floor or ceiling vents in the bedrooms
    d. Corners of closets or other similar small areas not frequently accessed or cleaned

3.0 Sample Collection

At least 16 samples will be collected from each of 10 properties. At each property, all samples will be collected from one floor (most often the first floor). These samples consist of the following:

- **Accessible** target areas (porous surfaces): One (parent) sample and one field duplicate sample, each collected as a 12-point composite to represent frequently accessed areas with porous surfaces on the selected floor

- **Accessible** target areas (non-porous surfaces): One (parent) sample and one field duplicate sample, each collected as a 12-point composite to represent frequently accessed areas of non-porous surfaces on the selected floor

- **Infrequent** target areas: One (parent) sample and one field duplicate sample, each collected as a 12-point composite, to represent infrequently accessed areas on the selected floor

- **Inaccessible** target areas: One (parent) sample and one field duplicate sample, each collected as a 6-point composite, to represent inaccessible areas on the selected floor. If 6 inaccessible sub-sample locations cannot be identified, the total number of sub-samples can be reduced as long as all available areas are included in the sub-samples. This must be clearly documented in the field log book and field sketches of sampling locations.

- **Whole-Floor Composite (30-second sampling):** One primary (parent) sample and one field duplicate sample, each a 30-point composite sample, will be collected from 30 templates placed in locations selected to represent the entire floor. The sampling locations will be semi-random, but should include at least 2-4 templates from inaccessible areas, and should include templates from 10-15 accessible porous surface locations, prioritized when possible to include a) carpet in entryways, frequently used rooms, and high traffic areas, b) upholstered furniture, and c) draperies/curtains in the living room or in other rooms of the floor. The remaining 11 – 18 template locations should be selected from accessible non-porous areas or from infrequently accessed areas. Each of the 30 templates will be collected using a vacuuming time of 30 seconds. The sampler should strive to make three collection passes per template during the 30 second interval. For purposes of consistency, each of these 30-point composites should be collected using three cassettes, each a

composite of 10 template areas. However if, any flow rate reduction is observed, collection of the sample on the existing cassette should be terminated and a new cassette should be substituted.

- **Whole-Floor Composite (120-second sampling):** One primary (parent) sample and one field duplicate sample, each a 30-point composite sample, will be collected as described above, except that each of the 30 templates will be collected using a vacuuming time of 120 seconds. The sampling locations for these templates should be co-located with the template locations for the 30-second composites (above).

- **High traffic areas:** One primary (parent) sample and one field duplicate, each a 3-point composite, from high traffic areas on the selected floor. Each template in the 3-point composite sample should be collected over 2 minutes according to the current site protocol (EPA 2003).

- **Horizontal surfaces:** One primary (parent) sample and one field duplicate sample, each a 3-point composite, from horizontal surfaces on the selected floor. Each template in the 3-point composite sample should each be collected over 2 minutes according to the current site protocol (EPA 2003).

Each sub-sample point (template) will cover 100 square centimeters (cm^2) using disposable paper templates for measurement. The pilot study will be completed using sampling procedures described in ASTM 5755-03 (ASTM 2003) and the Project-Specific Guidance Document for the collection of dust samples (CDM-LIBBY-10, Attachment 1) (unless noted).

- Flow rates – A flow rate of 2 liters/minute should be used for collection of all samples. Flow rates should be verified before sample collection begins and after each template is collected (especially in the case of the 30-point whole floor composite samples). If any flow rate reduction is observed, collection of the sample on the existing cassette should be terminated and a new cassette should be substituted. Samples that are collected on multiple cassettes will be combined at the level of the laboratory to achieve the desired multi-point composite sample.

- Sample Identification – All samples collected as part of this dust pilot study will be given sample numbers that begin with the letters "DP" (dust pilot). When two or more cassettes are needed for a sample, all of the sampling cassettes will be given the same base index ID number as the initial cassette, with the individual cassettes designated with the suffix –a, -b, -c, etc. For example, if a 30-point composite were collected on three cassettes, the three cassettes would be identified as:

  DP-00457-a
  DP-00457-b
  DP-00457-c

- Field Duplicates – Each field duplicate sample specified above will be collected from a template placed immediately adjacent to the location of the parent sample.

4.0 Documentation

For the purposes of the pilot study, a field sample data sheet (Attachment 2) and logbook entry will be completed for each sample collected.

4.1 Field Logbook and Sketch

For logbook entries, in addition to information required by CDM SOP 4-1 (Field Logbook Content and Control), the following will be recorded: Index (i.e., sample) ID, specific location and area (in cm^2) of each sub-sample, total flow rate, sample time, and times/flow rates of all calibration checks.

Logbook documentation will also include a sketch of the home and show the approximate location of each template. Each template location will be illustrated with the following notations that indicate the type of target area and the template number:

- AP_1, where "AP" represents Accessible (Porous) target areas and 1 represents the 1st template of the **Porous Accessible** target area sample
- AN_1, where "AN" represents Accessible (Non-Porous) target areas and 1 represents the 1st template of the **Non-porous Accessible** target area sample
- IF_2, where "IF" represents **Infrequent** target areas and 2 represents the 2nd template of the **Infrequent** target area sample
- IN_3, where "IN" represents **Inaccessible** target areas and 3 represents the 3rd template for the **Inaccessible** target area sample
- HT_1, where "HT" represents **High Traffic** target areas and 1 represents the 1st template of the **High Traffic** target area sample
- HS_2, where "HS" represents **Horizontal Surface** target areas and 2 represent the 2nd template of the **Horizontal Surface** target area sample

4.2 Field Sample Data Sheets (FSDSs)

The following guidance should be followed with completing the dust pilot study FSDS:

- Individual start/stop times are not required to be recorded on the FSDS. The initial start time and flow rates will be recorded in the location provided on the FSDS. At the conclusion of sample collection the stop time and ending flow rate will be recorded in the location provided on the FSDS. Care should be taken by the sampler to insure the time required per sub-sample location is carefully monitored. Entries will be completed on the FSDS for total sample collection time.
- When the sample collected is the field duplicate, the parent samples index ID number will be recorded in the field comments section of the FSDS.

- The template duration of the Whole-Floor composite samples should be recorded by circling the correct duration in the space provided in the field comments section.

- The matrix type for the Whole-Floor composite sample should be selected by circling only Whole-Floor composite in the matrix type parameter data item. Details regarding the locations sampled will be detailed in the location details section of the FSDS.

5.0 Sample Custody

All pilot study dust samples will be handled in accordance with current project sample custody procedures.

Chain-of-custody records will be completed by hand, as the data collected to support this effort will not be recorded in the project databases, see Section 7.0).

6.0 Sample Preparation and Analysis

Samples will be prepared for analysis in basic accord with SOP EPA-Libby-08, which describes procedures for the indirect preparation of air and dust samples. In all cases where a composite sample has been collected on more than one filter cassette (this will be the case for 30-point whole-floor composite samples), all cassettes with the same sample index ID number will be combined at the laboratory during sample preparation and analyzed as one sample.

Because all of the samples collected as part of this pilot study are classified as "investigative", all samples should be prepared using the ashing procedure. It is expected that this may help reduce loading of organic debris on the secondary filters, and will help minimize the requirement for multiple dilutions of the sample.

All samples will be analyzed by TEM in accord with method ISO 10312 (ISO 10312:1995(E)) with project-specific modifications LB-000016, LB-000019, LB-000029, LB-000029a, LB-000030, LB-000053, and LB-000066b (CDM 2003). All asbestos structures (including not only LA but all other asbestos types as well) having length greater than or equal to 0.5 um and an aspect ratio ≥ 3:1 will be recorded on the Libby site-specific laboratory data sheets and electronic deliverables.

The target analytical sensitivity for dust samples collected as part of this pilot study will be 20 structures per cm^2. If LA structures are plentiful, the analysis may cease after completing analysis of the grid opening which contributes the 50^{th} LA structure. If neither the target sensitivity nor a count of 50 LA structures are achieved after counting 50 grid openings, the laboratory shall contact EPA/CDM/Volpe for instructions.

7.0 Data Management

All data collected as part of the pilot study will initially not be loaded into the Libby project database or the Libby Field Office (LFO) version of eLASTIC. Instead the entire data set (logbook entries, FSDSs, COCs, and analytical results) will be provided to SRC

via the project eRoom. The need to load data from this pilot study into the main project databases will be determined after the data for this pilot study are evaluated.

8.0 References

ASTM. 2003. Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading. ASTM D5755-03. June 2003.

CDM. 2003. Modifications to Laboratory Activities. 1st Revised December 23, 2003 with ongoing updates.

EPA. 2003. Sampling and Analysis Plan for Indoor Dust, Revision 0. August 7, 2003.

ISO. 1995. Ambient Air – Determination of Asbestos Fibers – Direct Transfer Transmission electron Microscopy Method. ISO 10312:1995(E).

Attachment 1
CDM-LIBBY-10
Collection of 30-Point Composite Microvacuum Dust Sample for Determining Nature and Extent of Libby Amphibole Asbestos (LA) in Indoor Dust

Site-Specific Sampling Guidance
Libby Superfund Site

Guidance No: CDM-LIBBY-10, Revision 1

Guidance Title: Collection of 30-Point Composite Microvacuum Dust Samples for Determining Nature and Extent of Libby Amphibole Asbestos (LA) in Indoor Dust

Approved by:

Technical Reviewer — Date: 5/10/07

QA Reviewer — Date: 5/10/07

Volpe Center Approval — Date: 05/10/07

EPA Approval — Date: 5/10/07

Section 1
Purpose

The purpose of this standard operating procedure (SOP) is to provide a consistent method for the collection of 30-point composite microvacuum dust samples. This SOP is to be used by contractors/subcontractors supporting EPA investigation activities at the Libby Superfund Site. This SOP describes the processes by which sample locations will be selected and the procedures used to collect samples. Samples collected according to this SOP can be used to determine the nature and extent of LA in indoor dust for assessing clean-up requirements.

Section 2
Responsibilities

Successful execution of this SOP requires a clear hierarchy of assigned roles with different sets of responsibilities associated with each role. All staff with responsibility for the collection of indoor dust samples is responsible for understanding and implementing the requirements contained herein as well as any other governing guidance documents.

Task Leader (TL) or Field Team Leader (FTL) - The TL or FTL is responsible for overseeing sample collection processes as described in EPA-approved governing guidance documents (i.e., site-specific sampling and analysis plans [SAPs], quality assurance project plans [QAPPs], etc.). The TL or FTL is also responsible for checking all work performed and verifying that the work satisfies the specific tasks outlined by this SOP and all governing guidance documents. The TL or FTL will communicate with the field team members regarding the specific collection objectives and anticipated situations that require deviation from this SOP. It is also the responsibility of the TL or FTL to communicate the need for any deviations from the SOP with the appropriate EPA personnel (team leader or their designate), and document the deviations using a Field Modification Form provided in each SAP or QAPP.

Field team members - Field team members performing the sampling described in this SOP are responsible for adhering to the applicable tasks outlined in this procedure while collecting samples at properties associated with the Libby Superfund Site. The field team members should have limited discretion with regard to collection procedures but should exercise judgment regarding the exact location of sample points, within the boundaries outlined by the TL or FTL.

Section 3
Equipment

This section provides a list of equipment required to collect dust samples according to the site-specific protocols detailed in Section 4 and to meet the requirements of American Society for Testing and Materials (ASTM) method D5755-03 (ASTM 2003).

- Sampling pump – The sample pump used in the collection of microvacuum dust samples will be capable of flow rates typically used for dust sampling, 2.0 liters per minute (L/min). The pump must be capable of providing a non-fluctuating air-flow through the sampling media, and maintain the initial flow-rate volume to within ±10 percent (%) throughout the sampling period.

- Rotameter – A rotameter will be used as a secondary calibration standard as required for verifying the flow rate of the sampling pump used for sample collection. The rotameter will be calibrated such that the operator can measure flow rates to ±5% accuracy at the expected flow rate. Each rotameter in use should be calibrated against a primary standard as required according to manufacture recommendations and governing guidance documents.

- Sample cassettes – The sample cassettes used for the collection of microvacuum dust samples at the Libby Superfund Site are a commercially available 25-millimeter (mm), three-piece cassette with a 50-mm electronically conductive extension cowl loaded with a 0.45 micrometer (µm) mixed cellulose ester (MCE) filter. The sampling nozzle attached to the cassette inlet will meet the following specifications as described in ASTM D5755-03 (ASTM 2003): the sampling end will be cut at a 45° angle, and the length of tubing will be at least 25 to 37 mm in length and 0.25 inches in diameter.

- Inert tubing - Tygon® tubing with a 3/16-inch inner diameter and 5/16-inch outer diameter is used in the sample collection train to connect the outflow end of the sample cassette to the sampling pump.

- Sample ID labels (Index IDs) – pre-printed index ID number labels are placed on the sampling cassette to indicate the unique sampling number assigned to the sample. Index ID labels can also be used in logbooks/PDAs and on other field forms for sample identification. The specific index ID numbers used will be detailed in governing guidance documents.

- Collection area templates – 10 by 10 centimeter (cm) reusable plastic or disposable cardstock (paper) templates are used to delineate each sample point. When a plastic template is used, it will be wiped with a disposable wet towel between each individual sample (i.e., not between individual aliquots). When a paper template is used, a new template will be used after each sample.

- Zip-top plastic bag – after sample collection is complete, each sample cassette will be placed in an individual zip-top plastic bag. The index ID label will be placed on the outside of the zip-top bag and affixed with clear tape if necessary. The index ID may also be written on the outside of the bag using a permanent marker (preferred). Sample cassettes are placed into individual bag to mitigate the potential for cross-contamination in the event that a cassette should open during handling or shipping.

- Field logbook or PDA -used to record progress of the sampling effort and record any problems and field observations.
- Cooler or other ridged container - used to store samples while in the field.
- Custody Seals - aid in ensuring the integrity of samples during handling or shipping.
- Latex or Nitrile Gloves – Worn during dust sample collection to prevent cross-contamination.

Section 4
Selection of Sample Locations

Governing guidance documents should be consulted to determine when microvacuum dust sampling is required.

When sampling is required, one 30-point composite sample will be collected on a single sampling cassette per living floor, or as required for secondary buildings. Each dust sample will be collected from areas classified on a scale of accessibility as described below:

1. **Accessible** areas refer to locations where exposures are most likely to occur – places where dust accumulates and is encountered daily. This includes soft surfaces such as carpet (not including movable floor mats), upholstered furniture, floors, and waist-high hard surfaces such as counter tops and non-carpeted floors.

2. **Infrequently accessed** areas refer to locations where dust may accumulate, but exposures are likely to occur infrequently. This includes areas on tops of shelves, entertainment centers, and refrigerators, etc.

3. **Inaccessible** areas refer to locations where dust may accumulate but exposures occur only rarely, such as behind refrigerators or other large infrequently moved objects.

To the extent possible, the sample point locations will be collected from each type of accessibility area as indicated below:

1. **Accessible** target areas, if present (as indicated, some locations described should only be included when visible dust can be observed with the unaided eye of the field team members):
    a. Flooring (soft or hard surface) at the main entrance used by occupants
    b. Flooring at the secondary or less heavily used entrance to the home
    c. Flooring in the center of the living room or family room
    d. Flooring in the center of bedrooms

e. Flooring in an acknowledged or evident route of high traffic (i.e., hallway or other thoroughfare)
f. Flooring in the kitchen
g. Kitchen counter tops, ***only when visible dust is observed***
h. Table tops in the following rooms: dining room, living room, or family room, ***only when visible dust is observed***
i. Table tops (e.g., night stands, bureaus) in bedrooms, ***only when visible dust is observed***
j. Window sills in the dining room, living room, or family room
k. Window sills in the bedrooms
l. Upholstered furniture in the living room

2. **Infrequent** target areas, if present:
   a. Top of the refrigerator, when top is exposed
   b. Top of bookshelves
   c. Shelves of bookshelves
   d. Top of the hot water heater
   e. Top of wood stoves
   f. Fireplace mantels and/or hearths
   g. Beneath the sofa or other large pieces of furniture in the living room
   h. Beneath the bed or other large pieces of furniture in bedrooms
   i. Inside kitchen cabinets most frequently accessed

3. **Inaccessible** target areas, if present:
   a. Beneath infrequently moved heavy appliances when accessible without moving the appliance (e.g., refrigerator, washing machine, dryers, dishwashers, etc.)
   b. Inside forced air floor or ceiling vents in the living room
   c. Inside forced air floor or ceiling vents in the bedrooms
   d. Inside forced air floor or ceiling vents in the kitchen or bathroom
   e. Corners of closets or other similar small areas not frequently accessed or cleaned

The preferred distribution of the 30-sample points among the three target areas described above is as follows:

- 12-sample points collected from **Accessible** target areas
- 12-sample points collected from **Infrequent** target areas
- 6-sample points collected from **Inaccessible** target areas

Sampling Contingencies

The preferred sample distribution may not always be achievable given the varying conditions of buildings at the Libby Superfund Site. This section discusses situations

when the preferred distribution may not be achieved and provides guidance to the field team members for determining how sample points should be distributed.

1. When the preferred distribution cannot be achieved due the lack of locations in a specific target area category, the remaining number of sampling locations required to reach a total of 30-sample points should be distributed among other target areas according to the preferred distribution ratio (2:2:1).

   For example: If 12 **Accessible** and 12 **Infrequent** target areas are identified and sampled, and only 2 **Inaccessible** target areas are identified and sampled; 4 points remain to be sampled so the total number of sample points adds to 30. The four remaining locations should be distributed evenly among **Accessible** and **Infrequent** target areas, with 2 sample locations collected from each area type.

   If the preferred distribution cannot be achieved, the number of sub-sampling points collected for the composite sample will be recorded as specificed by project specific guidance.

   When unfurnished areas, primary buildings, or secondary building require dust sampling, the locations selected for **Accessible** and **Infrequent** target areas should include flooring and all available horizontal surfaces. It may be necessary to collect several sample points from flooring within the same room in order to meet the overall goal of collecting 30points. The potential issues discussed in Sampling Contingency #1 also apply to this situation.

2. In some cases secondary buildings may be so small that 30 discrete sample points do not exist in the building. This is most likely to occur when dust sampling in a pump house or other similarly sized structure. When this situation is encountered, the field team member will record the number of locations that were obtained and document this deviation according the governing guidance document. The potential issues discussed in Sampling Contingency #1 also apply to this situation.

Section 5
Sample Procedures

Once sampling cassettes have been deemed usable via submittal of lot blanks to the analytical laboratory (see Section 8.2), each sample will be collected, after calibration of the sampling pump and identification of individual increments (sub-samples), according to the following procedures modified from ASTM D5755-03 (ASTM 2003):

1. Set-up the sampling train by attaching the sampling cassette to the sampling pump at the outlet side of the cassette with the required tubing. The length of tubing between the sampling cassette and the sampling pump should be long enough to allow sampling locations to be reached without interfering with the

operation of the sampling pump. If a pre-assembled cassette is used, remove the end cap. If a an inlet nozzle must be assembled:

a. Attach an unused portion of tubing, approximately 25.4 mm in length with an internal diameter of 6.35 mm, directly to the inlet orifice.

b. Cut the sampling end of the tubing at a 45° angle leaving a length of tubing between 25 mm and 37 mm between the inlet orifice and the cut end of the tubing.

2. Don latex or nitrile gloves.

3. Place a sampling template on the area to be sampled. Turn the sampling pump on and begin timing using a stopwatch. Each template (sub-sample location) should be sampled for approximately 30 seconds at a flow rate of 2.0 L/min. The field team member should strive to make three orthogonal collection passes per template during the 30second interval. During the collection period, the surface being sampled should not be scraped or abraded with the collection nozzle.

4. When the 30-second collection period has been completed, invert the sampling cassette so the collection nozzle is pointed upwards. Turn the sampling pump off and stop the stopwatch (do not clear the time from the watch).

5. Repeat sample collection as described in Steps 2 and 3 for the remaining sampling points collecting a cumulative time of collection (approximately 15 minutes) on the stopwatch.

6. During the dust sampling pilot, verify the flow rate after every 5th sampling location (5th, 10th, 15th, 20th, 25th, and 30th) according to the following:

a. Turn the sampling pump off.

b. Connect the rotameter in a calibration train. Ensure the rotameter is within 6° of vertical.

c. Turn the sampling pump on.

d. Record the observed flow rates on the rotameter according to governing guidance document.

e. If required, adjust the flow rate back to 2.0 L/min according to instructions provided for the specific the sampling pump in use.

f. Turn the sampling pump off.

g. Record the value of the ending flow rate according to the governing guidance documents.

The verification frequency may be reduced after experienced is gained during the collection activities.

After the pilot phase, verify the flow rate at the beginning and at the end of each sampling event for each floor.

7. After the last location has been sampled and the final flow rate recorded as described in Step 5, turn the sampling pump off and seal each end of the cassette with a cassette end-plug. This can be done with either the sampling nozzle left in place (preferred) or removed. If the nozzle is removed it should also be sealed at both ends with an end-plug and placed in a separate zip-top bag for shipment to the laboratory. The nozzle is always saved and rinsed at the laboratory during sample preparation because a significant percentage of the dust drawn from a lightly loaded surface may adhere to the inside walls of the tubing.

8. Record the total elapsed sample collection time and total area sampled and other information as required according to governing guidance documents.

9. Wipe off the exterior surface of the cassette with disposable wet towel.

10. Place a sample label (index ID) on the cassette that clearly identifies the sample's unique identification number on the cassette.

11. Place a sample custody seal around both ends of the sampling cassette in a manner that does not obstruct the sample label.

12. Place each sample cassette in an individual plastic zip-top bag. Each bag should be labeled indicating the sample index ID. Do not put the sample cassette in a shirt or coat pocket as the filter can pick up fibers from clothing.

13. Decontaminate sampling equipment as required by the governing guidance document.

14. Transport the samples in a ridged container to the sample coordinator or designated recipient.

Dust field duplicate samples will be collected at the frequency required in the governing guidance documents. Field duplicate samples will be collected immediately adjacent to the locations of the parent sample. The duplicate will be collected from the same number of sub-samples as the parent sample, and be distributed across assess areas identically to the parent sample. For tracking purposes, the parent/duplicate sample relationship will be recorded in accordance with sample documentation requirements stated in the governing guidance document.

Section 6
Sample Custody and Shipment

Dust samples will be kept separate from other types of media sampled (i.e., soil, air, water, building materials, insulation, etc.) and should be transported in a ridged container until the field team can relinquish custody to the sample coordinator or designated recipient.

When dust samples are be shipped to on off-site analytical laboratory, a ridged sealed container will be used. Dust samples will be shipped separated from any other types of media. The cassettes must be tightly sealed and packaged in a material free of fibers or dust to minimize the potential for contamination. Plastic bubble wrap is an example of the appropriate material for this purpose. Examples of inappropriate materials are paper and packing peanuts.

Section 7
Documentation

As required by governing guidance documents, a field logbook/PDA will be maintained by each individual or team that is collecting samples as described in this SOP. The guidance documents will detail specific conditions which require attention and documentation, but at a minimum the following information should be collected:

- Project name
- Title of governing documents
- Property address
- Date
- Time
- Team members
- Weather conditions
- Locations of any samples or sub-samples that could not be acquired
- Descriptions of any deviations to the SOP or SAP and the reason for the deviation
- Relinquishment of samples to project sample coordinator or other recipient

In addition to logbook/PDA documentation, specifics regarding details of the sample collection will be recorded as required by governing guidance documents.

Section 8
Quality Assurance/Quality Control

8.1 Equipment Maintenance

The manufacturer's instructions regarding operating procedures and maintenance will be reviewed prior to equipment use. Equipment and instrumentation will be utilized in accordance with manufacturer's instructions.

8.2 Collection of Field Quality Control Samples

Field quality control (QC) samples will consist of three types: lot blanks, field blanks, and field duplicates. The Site-Wide QAPP (CDM 2007) describes each of these samples, their corresponding acceptance criteria, and potential actions if acceptance criteria are not met. Governing guidance documents should be consulted to determine the required collection frequency for each sample type.

Section 9
Glossary

Governing guidance documents - The written document that spells out the detailed site-specific procedures to be followed by the project leader and the field personnel for completing specific investigations. These documents will clearly indicate specific requirements for the implementation of this SOP.

Sample Point - The actual location at which the dust sample is taken. The dimension of a sample point is 100 cm^2.

Composite Sampling - A sample program in which multiple sample points are compiled together and submitted for analysis as a single sample.

Libby Superfund Site **–** The Libby Superfund Site contains all buildings and land within the boundaries of each operable unit (OU) of the site and illustrated on the most recent version of the OU boundary map.

Section 10
References

ASTM. 2003. Standard Test Method for Microvacuum Sampling and Indirect Analysis of Dust by Transmission Electron Microscopy for Asbestos Structure Number Surface Loading. ASTM D5755-03.

CDM. 2007. Site-Wide Quality Assurance Project Plan. Draft in review.

Attachment 2
Pilot Study Field Sample Data Sheet

Sheet No.: D- **00«seq»**

LIBBY FIELD SAMPLE DATA SHEET (FSDS) FOR *DUST PILOT STUDY*

Field Logbook No: _____ Page No: _____ Sampling Date: _____

Address: _____ Owner/Tenant: _____

Business Name: _____

Land Use: Residential School Commercial Mining Roadway Other ( )

Sampling Team: CDM Other _____ Names:_____

Data Item	Parameter Details
Index ID	
Location ID	
Sample Group (circle) (Subgroup of the property)	House Other_____
Location Description (circle) (Detailed description point within the location)	Basement, Ground Floor, Second Level Other_____
Matrix Type (circle)	Horizontal Surfaces High Traffic Areas Accessible Areas Infrequently Accessed Areas Inaccessible Areas Whole-Floor Composite Other_____
Category (circle)	FS FB-(field blank) FD-(field duplicate) LB-(lot blank)
Sample Area (cm^2) (circle)	300 600 1,000 1,200 NA Other_____
Filter Diameter (circle)	25mm 37mm
Pore Size (circle)	TEM- 0.45 PCM- 0.8
Flow Meter Type (circle)	Rotameter Dry-Cal NA
Pump ID No.	
Flow Meter ID No.	
Start Time	
Start Flow (L/min)	
Stop Time	
Stop Flow (L/min)	
Pump Fault? (circle)	No Yes
Total Time (minutes)	
Total Flow (liters)	
Field Comments Cassette Lot Number: _____	Parent sample Index ID: Aliquot time interval: 2mins or 30sec Archive Blank (circle): Yes No
Entered (LFO) _____	Volpe: Entered ____ Validated ___

Location Details (circle all that apply)

Accessible - POROUS SURFACES (Target 12 points)

1. Carpeted flooring, secondary entrance: (# of points): ____
2. Carpeted flooring, living room: (# of points): ____
3. Carpeted flooring, bedroom(s): (# of points): ____
4. Carpeted flooring, high traffic route: (# of points): ____
5. Carpeted flooring, kitchen: (# of points): ____
6. Upholstered furniture: (# of points): ____
7. Drapes or curtains: (# of points): ____
8. Other:_____: (# of points): ____

Accessible - NON-POROUS SURFACES (Target 12 points)

1. Un-carpeted flooring, main entrance: (# of points): ____
2. Un-carpeted flooring, secondary entrance: (# of points): ____
3. Un-carpeted flooring, living room: (# of points): ____
4. Un-carpeted flooring, living room: (# of points): ____
5. Un-carpeted flooring, bedroom(s): (# of points): ____
6. Un-carpeted flooring, high traffic route: (# of points): ____
7. Un-carpeted flooring, kitchen: (# of points): ____
8. Kitchen counter tops: (# of points): ____
9. Table top(s), living room: (# of points): ____
10. Table top(s), dining room: (# of points): ____
11. Table top(s), bedrooms (# of points): ____
12. Window sill(s) in living room (# of points): ____
13. Window sill(s) in dining room (# of points): ____
14. Window sill(s) in bedrooms (# of points): ____

Infrequently Accessed (Target 12 points)

1. Top of refrigerator (# of points): ____
2. Top of bookshelves (# of points): ____
3. Shelves of bookshelf (# of points): ____
4. Top of hot water heater (# of points): ____
5. Beneath furniture in living room (# of points): ____
6. Beneath furniture in bedrooms (# of points): ____
7. Inside kitchen cabinets (# of points): ____

Inaccessible Areas (Target 6 points)

1. Beneath heavy appliances (# of points): ____
2. Forced air vents in main living room (# of points): ____
3. Forced air vents in bedrooms (# of points): ____
4. Corner of small areas (# of points): ____

***Horizontal Surfaces (Target 3 points)**: Describe locations in log*

***High Traffic Areas (Target 3 points)**: Describe locations in log*

Field Team Completion (Initials)	Completed by	QC by

vs 051507